A Termite (Isoptera) in Late Cretaceous Amber from Vendée, Northwestern France

Author: Engel, Michael S.

Source: Paleontological Contributions, 2014(10E) : 21-24

Published By: The Paleontological Institute at The University of Kansas

URL: https://doi.org/10.17161/PC.1808.15985

Paleontological Contributions

December 1, 2014 Number 10E

A TERMITE (ISOPTERA) IN LATE CRETACEOUS AMBER FROM VENDÉE, NORTHWESTERN FRANCE

Michael S. Engel

University of Kansas Biodiversity Institute, Division of Entomology (Paleoentomology), and Department of Ecology & Evolutionary Biology, 1501 Crestline Drive – Suite 140, Lawrence, Kansas 66045, USA, msengel@ku.edu

ABSTRACT

A new genus and species of primitive termite is described and figured from the remains of an alate in Late Cretaceous (Cenomanian to Santonian) amber from the Department of Vendée in northwestern France. *Termitotron vendeense* n. gen. and sp. is distinguished on the basis of its head and wing morphology and exhibits unique features in the mouthparts relative to other Cretaceous termite genera. Brief comments are made on its possible affinities among the "*Meiatermes* grade" of Euisoptera.

Keywords: Insecta, Isoptera, Cretaceous, amber, France, Dictyoptera

RÉSUMÉ

Un nouveau genre et une nouvelle espèce de termite primitif sont décrits et figurés d'après les restes d'un individu ailé préservés dans l'ambre crétacé supérieur (Cénomanien à Santonien) de Vendée, nord-ouest de la France. *Termitotron vendeense* n. gen et sp. se distingue par sa morphologie de la tête et des ailes, et ses pièces buccales présentent des caractères uniques par rapport aux autres genres de termites crétacés. Ses affinités possibles au sein du "grade *Meiatermes*" des Euisoptères sont brièvement commentées.

Mots-clés: Insecte, Isoptère, Crétacé, ambre, France, Dictyoptère

INTRODUCTION

Today, termites (Isoptera) are a ubiquitous feature of virtually all temperate and tropical ecosystems, particularly numerous in tropical forests and savannahs, and among the most critical of all detritivores. The majority of living species, belonging to the derived families Rhinotermitidae and Termitidae, live in frequently large, perennial colonies, can be relatively dense in numbers, and serve as the principal recyclers of plant material (Grimaldi & Engel, 2005). Isoptera extend back to the earliest stages of the Cretaceous (Engel, Grimaldi, & Krishna, 2007a), although until the mid-Tertiary the lineage did not exhibit the ecological dominance and abundance for which they are so famous today, although they were certainly eusocial already by that time (Engel, Grimaldi, & Krishna, 2009). During the Mesozoic the termites were represented by a grade of primitive groups whose survivors today frequently live in relatively small colonies (although *Mastotermes darwiniensis* Froggatt is a notable exception), feeding on felled and decomposing logs or grasses (e.g., Archotermopsidae and Hodotermitidae). It is fascinating to imagine how lignocellulose was broken down and nutrients recycled in an epoch in which termites were such a minor component of the fauna. An intimate understanding of the early fossil history of termites is needed in order better to elucidate isopteran diversification and their eventual rise to become the pre-eminent recyclers of the modern era.

The number of Cretaceous termites has risen remarkably during the last 15 years, with more species discovered and described during that period than all other works prior (Krishna & others, 2013). Herein is documented a fragmentary termite in Late Cretaceous (Middle Cenomanian to Early Santonian) amber from northwestern France. This is the first termite from the Late Cretaceous of Europe and the only record from the amber-bearing strata of the department of Vendée. Although the specimen is fragmentary within the amber piece, there is a remarkable amount of information available from

 | urn:lsid:zoobank.org:pub:04C1C180-51F2-4869-B4E5-B7A3F79F6F7D

the observed character details. A brief description is provided and a few comments made on its affinities.

MATERIAL AND METHODS

The unique specimen is fossilized in a piece of clear yellow amber that was collected in 2002 by Fanny Dupé from a deposit exposed briefly during work for the enlargement of the road D32 between La Garnache and Challans, in the department of the Vendée, northwestern France. The exact dating of the amber-bearing stratum remains uncertain within the Middle Cenomanian–Early Santonian interval (97–85 Ma), and resolving this issue is still work in progress (see Perrichot & Néraudeau, 2014: 10A in this volume). The original amber piece split into four smaller fragments during the polishing of its surface due to internal fracture planes, but this did not affect the integrity of the fossil since it was already fragmentary when entombed in the resin flow. The specimen comprises an isolated head capsule and the shed fore and hind wings of an alate. The head is situated along an internal fracture plane within the amber flow and this obscures a direct dorsal view. Nonetheless, a beautifully detailed ventral and slightly oblique view is possible and shows clearly several important details such as the presence of a preoccipital sulcus and the form of the labium. In addition, the compound eyes are clear as is the associated integument along their upper boundary curving onto the dorsum of the head and into the fracture plane. Unfortunately, neither antenna is complete beyond the basalmost antennomeres. The wings are preserved in two other fragments of what was originally the single piece of amber. The piece split along the plane of the wings such that, in the larger piece, a complete pair of wings is preserved along with a relatively complete forewing and fragments of the second hindwing. From one side the wings are seen through and within the resin, while from the other side they are exposed and appear as impressions in the amber surface. The opposing and smaller piece of amber preserves the reverse of this impression. Together, the two pieces give a rather complete perspective on the venation. The most complete wings are preserved beyond the wing scales, the others are partially preserved and only parts well beyond the scales are present, and are presumed to have been shed at the time of entrapment.

Photomicrographs were prepared using a Canon 7D digital camera attached to an Infinity K-2 long-distance microscope lens and illuminated by both reflected and transmitted light from a timed Xenon flash. Measurements were taken with an ocular micrometer on an Olympus SZX-12 stereomicroscope. Morphological terminology follows that of Krishna and others (2013) and the format of the description is generally based on those of Engel, Grimaldi, and Krishna (2007a, 2007b, Engel & others, 2011), Engel and Gross (2009), and Engel and Delclòs (2010). The classification adopted is that of Engel, Grimaldi, and Krishna (2009) as augmented by Krishna and others (2013).

SYSTEMATIC PALEONTOLOGY

Infraorder ISOPTERA Brullé, 1832
Family *incertae sedis*

'MEIATERMES-GRADE'
Genus TERMITOTRON new genus

Figure E1. Photomicrograph of head of holotype of *Termitotron vendeense* n. gen. and sp.

Type species.—*Termitotron vendeense*, new species.

Diagnosis.—Imago. Head rounded, lateral and posterior margins gently rounded; basal part of antenna moniliform (scape, pedicel, and first flagellomere); compound eyes circular, relatively small; ocelli apparently absent (somewhat uncertain); occipital carina present; subgenal sulcus present; occipital foramen rounded (as in *Mastotermes*); maxillary palpus pentamerous, characteristically compact, with basal three palpomeres reduced and transverse, fourth palpomere longer than wide, about as long as combined length of basal three palpomeres, apical palpomere longer than wide, subequal in length to fourth palpomere, entire palpus scarcely surpassing apex of labrum (in most termites the maxillary palpomeres are more elongate in shape). Forewing with membrane highly reticulate and relatively rounded apex; all veins apparently originating inside wing scale; Sc terminating at about wing midlength; R1 simple for most of length, with short superior twig near apex, terminating just anterior of wing apex; Rs encompassing wing apex, without superior branches, at least two primary inferior branches, proximal-most branch forking near wing apex; M running about midway between Rs and CuA, branching in apical half of wing; CuA encompassing posterior margin of wing to about four-fifths of wing length, with numerous branches, most simple, although more apical branches forking near wing margin; hind wing without anal lobe (unlike Mastotermitidae).

Etymology.—The new genus-group name is a combination of *Termes*, meaning, "termite", and *thronion*, neuter diminutive meaning "throne" (as in the archangel Metatron). The gender of the name is considered neuter.

TERMITOTRON VENDEENSE new species
Figures E1–E2

Type material.—Holotype alate (sex indeterminate), IGR.GAR-30 (ex coll. F. Dupé), in Late Cretaceous (Middle Cenomanian to Early Santonian, 97– 85 Ma) Vendean amber; deposited in the Geological Department and Museum of the University Rennes 1, France.

Type locality.—La Robinière, departmental road D32, about 2.5 km southwest of La Garnache, Vendée, France.

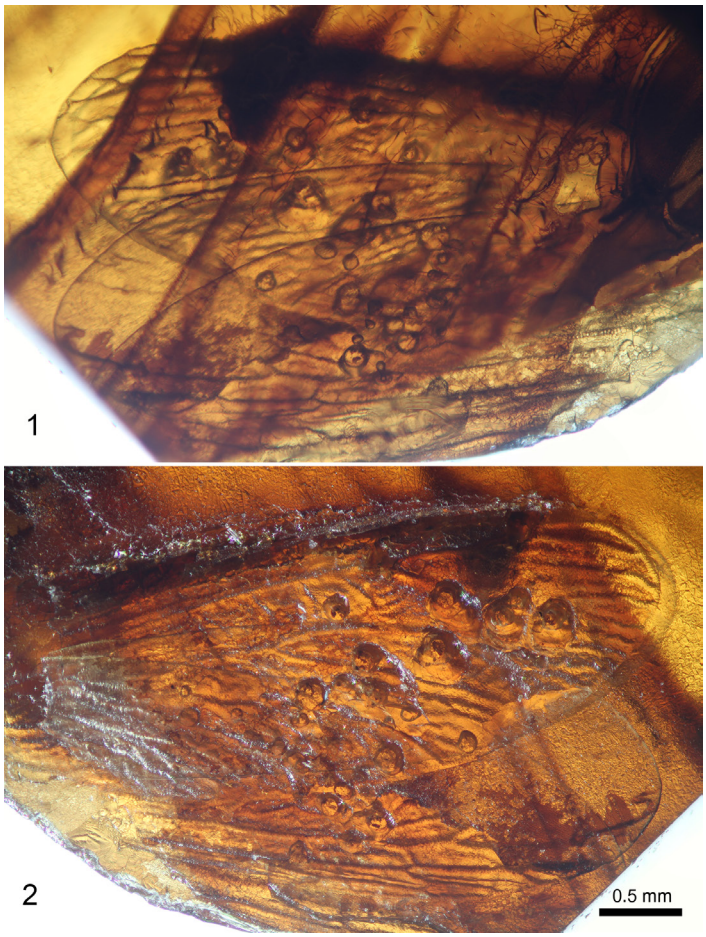

Figure E2. Photomicrographs of wings of holotype of *Termitotron vendeense* n. gen. and sp. *1*, Wings as viewed through the amber piece; *2*, Wings preserved at the surface of the amber piece.

Etymology.—The specific epithet refers to the Department of Vendée where the amber originates.

Diagnosis.—As for the genus (see above).

Description.—Imago. Head brown, matte, legs brown; wing apparently hyaline; head with sparse suberect, short setae, more elongate setae present on labium, maxilla, and labrum; wing apparently bare, without nodules or seta, membrane reticulate (Fig. E2.1). Head generally round, apparently slightly longer than wide (direct measure of width not possible; compound eye round, moderately convex, relatively small, separated from posterior border of head by more than compound eye diameter, integument bordering upper tangent of compound eye without evident ocelloid; mandibles partly visible but dentition not entirely discernable; basal portion of antenna moniliform, 3 antennal articles preserved, first slightly thicker than pedicel and first flagellomere; submentum quadrate, mentum short and relatively transverse, labial palpus trimerous, palpomeres short, only slightly longer than wide; maxillary palpus pentamerous, basal palpomeres greatly compact, combined length of basal three palpomeres about equal to length of fourth palpomere, apical palpomere subequal to fourth palpomere, with blunt apex, fourth and fifth palpomeres with a few long, suberect setae. Forewing Sc simple, running close to anterior wing margin, terminating near wing midlength; R1 running near anterior wing margin, simple for majority of length, a single superior branch near termination anterior to wing apex; radial field relatively broad and expanding slightly apically (plesiomorphy), such that Rs encompasses wing apex; Rs with at least two strong branches present, basalmost forked near wing margin and terminating just behind wing apex, apicalmost branch terminating at wing apex; M separated from R prior to basal suture such that M is already a free vein, M branching at about wing midlength, with at least two distinct branches, at least apicalmost forking near wing margin; CuA well-developed, with at least 8 posterior branches, covering main part of posterior wing margin, more apical branches forking near margin. Length of head 1.17 mm; diameter of compound eye 0.29 mm, temple length (posterior of compound eye to posterior of head) 0.42 mm; length of forewing from suture 4.73 mm, width of forewing 1.87 mm.

DISCUSSION

Naturally, it is unfortunate that the present specimen is so fragmentary, represented only by the wings and an isolated head. The entirety of the thorax and abdomen are missing and were presumably in another shard of the amber which was not recovered. Important information regarding the pronotum, tarsal formula, leg spination, cerci, styli, and other characters remains to be discovered. Nonetheless, it is possible to make some simple statements concerning the identity and affinity of the present species. The broad radial area with multiple branches of Rs excludes affinities with the Icoisoptera (=Neoisoptera + Kalotermitidae). The possession of notable plesiomorphies such as the occipital carina and reticulate wing membranes is indicative of the primitive grade of Cretaceous termites known generally as the "*Meiatermes* grade", basal among the Euisoptera. The wing venation is generally like many of the genera in this grade, including some other groups from the Cretaceous of France such as *Santonitermes* Engel, Nel & Perrichot and *Syagriotermes* Engel, Nel & Perrichot (Engel & others, 2011). The venation of *Termitotron* is most similar to *Santonitermes*, although the form of R1 and Sc are unknown for the latter, but the distinctive, compressed form of the palpi in the former can readily distinguish it. From *Syagriotermes*, the new genus can be distinguished by the more elongate Sc and Rs encompassing the wing apex. It is greatly hoped that more complete material may be recovered in the future and the distinctive apomorphy of the maxillary palpus should make future identification of conspecifics relatively simple.

ACKNOWLEDGEMENTS

I am grateful to Dr. Vincent Perrichot for bringing the specimen to my attention, permitting its study, and providing a French translation of my abstract; to Fanny Dupé (Arthon-en-Retz) who collected the amber pieces and donated them to the University Rennes 1; and to Dr. Ismael A. Hinojosa-Díaz for assistance with photomicrography as supported by the Engel Illustration Fund of the University of Kansas College of Liberal Arts and Sciences. Work on the Vendean amber was partly supported by CNRS-INSU grant

(research project Interrvie NOVAMBRE 2 to D. Néraudeau, University Rennes 1) and French National Research Agency grant nº BLAN07-1-184190 (project AMBRACE to D. Néraudeau). This is a contribution of the Division of Entomology, University of Kansas Natural History Museum.

REFERENCES

Brullé, G. A. 1832. Expédition scientifique de Moree. Section des sciences physiques zoologie. Deuxième section – des animaux articulés [Vol. 3, part 1]. F.G. Levrault. Paris, France. 400 pp.

Engel, M. S., & X. Delclòs. 2010. Primitive termites in Cretaceous amber from Spain and Canada (Isoptera). Journal of the Kansas Entomological Society 83(2):111–128.

Engel, M. S., & M. Gross. 2009. A giant termite from the Late Miocene of Styria, Austria (Isoptera). Naturwissenschaften 96(2):289–295.

Engel, M. S., D. A. Grimaldi, & K. Krishna. 2007a. Primitive termites from the Early Cretaceous of Asia (Isoptera). Stuttgarter Beiträge zur Naturkunde, Serie B, Geologie und Paläontologie 371:1–32.

Engel, M. S., D. A. Grimaldi, & K. Krishna. 2007b. A synopsis of Baltic amber termites (Isoptera). Stuttgarter Beiträge zur Naturkunde, Serie B, Geologie und Paläontologie 372:1–20.

Engel, M. S., D. A. Grimaldi, & K. Krishna. 2009. Termites (Isoptera): Their phylogeny, classification, and rise to ecological dominance. American Museum Novitates 3650:1–27.

Engel, M. S., A. Nel, D. Azar, C. Soriano, P. Tafforeau, D. Néraudeau, J.-P. Colin, & V. Perrichot. 2011. New, primitive termites (Isoptera) from Early Cretaceous amber of France and Lebanon. Palaeodiversity 4:39–49.

Grimaldi, D., & M. S. Engel. 2005. Evolution of the Insects. Cambridge University Press. Cambridge, UK. xv+755 pp.

Krishna, K., D. A. Grimaldi, V. Krishna, & M. S. Engel. 2013. Treatise on the Isoptera of the world. Bulletin of the American Museum of Natural History 377:1–2704.

Perrichot, V., & D. Néraudeau. 2014. Introduction to thematic volume "Fossil arthropods in Late Cretaceous Vendean amber (northwestern France)". Paleontological Contributions 10A:1–4.